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CENTRAL INTELLIGENCE AGENCY

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1. From 12 March 1956 to late October 1956, a radar course took place for members of the NVA at Kuehlungsborn. During this course, type P-8 radar stations had been erected on the western border of the barracks installation for signal officer candidates (Sea), about 1.5 km west of Kuehlungsborn-West, 100 meters from the beach.[1] While the units stayed at the summer camp from late August till early September 1956, the radar stations were transferred to Rerik, east of the Wustrow Penninsula.

2. Radar Antenna[3]

The mast of the radar antenna consists of aluminum tubing from 10 to 15 cm in diameter. The mast can be dismantled into three components and has a height of about 8 meters. It was mounted on an iron pedestal weighing about 150 lb. It was braced eight times and the wire ropes were insulated with egg-shaped porcelain insulators. The top of the mast mounted the reducing gear which consisted of a fixed and a rotating unit. This reducing gear which was about 1 meter high comprised the antenna motor, the high frequency voltage pick-up, and the rotating recorder (Drehmeldesystem).

The antenna proper is a seven-element yagi-type antenna, four-fold, in two planes. Its measurements were about 3 x 4 x 4 meters. The dipoles were about 180 cm long and had a thickness of about 1.5 cm. Each antenna unit had five directors and one reflector. The antenna was capable of full rotations as well as of swinging motions within specific sectors. The rotating recording system consisted of the recorder located in the reducing gear, and the receiver located in the panoranic view set and in the azimuth set. The transmission of the values determined was effected through a multi-core cable extending from the recorder to the receivers which were located in the apparatus truck. The current needed was produced by a generator mounted on a truck or was taken from the local mains (3x220 V). The current was fed to the input switchboard of the apparatus truck. It was then conducted to the distribution board and was fed from there into the individual components of the radar set.[4]

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3. IFF Antenna
The mast of the IFF antenna also consisted of aluminum tubing from 8 to 10 cm in diameter. It consisted of two components and had a height of about 6 meters. Its iron pedestals weighed about one hundredweight. The mast was braced with four wire ropes which were porcelain insulated. The reducing gear at the top was 60 to 70 cm high and the vertically polarized dipole antenna fitted with a surface reflector (Flaechenreflektor) measured about 1 x 2 meters. The antenna was capable of both rotating and swinging motions. 5

4. The IFF set consisted of a transmitter, a receiver, (6a) and a control desk for the antenna (6b). After the approximate position of an aircraft has been determined by the radar antenna, the IFF antenna is oriented in this direction by pushing a button at the control desk. The transmitter emits high frequency signals of a specific impulse frequency (50 to 450 Hts). The receiver of the aircraft (friend) responds to this frequency and automatically activates a transmitter which sends a coded reply in the form of previously arranged impulses. These impulses are made visible on the altitude visual indicator (Hoehensichtgeraet) and appear there as points which have a varying duration. The duration of a specific combination of signals is about four seconds.

5. Description of the Most Important Components of Type P 8 Radar Set
Cupboard 1 incorporates the transmitter, goniometer, receiver, the altitude visual indicator, blocking system (Blocksicherungseinrichtung) and rectifier for the antenna motor. 8

6. The transmitter produces high frequency impulses of a duration of eight microseconds, which are emitted via the antenna. The transmitter includes the keying apparatus and the VHF generator. 9

7. The goniometer incorporates line sections , the lengthening or reduction of the compensating lever of these sections shifts the antenna diagram and thus makes possible the determination of the altitude of the target. 10
The sliding contact can be put in two extreme positions. In one position most of the energy is picked up from the upper antenna, in the other position most of the energy is picked up from the lower antenna. The receiving diagram is changed according to the position of the sliding contacts. By turning the hand wheel at the goniometer, the sliding contacts move from right to left and stay arrested, according to the altitude of the target, in a position between the two extreme positions. By means of the installed ruler the altitude of the target is determined in hectometers on the scale.
The goniometer also incorporates the receiver throw-over switch (relay with four make-and-break contacts). The switch has three positions: coordinate-Auffassen (pick-up?)-azimuth. When in the azimuth position, the relay is being fed with direct current. In this case, the highfrequency current is directed through the goniometer. The altitude is determined by the minimum direction finding method. In the all around-view-position, the relay is being fed with direct current of reversed polarity. The contacts are thrown over the high frequency current is not fed via the goniometer; for this reason, no determination of altitude is possible. When in the coordinate-position, the relay is being fed with 50-cycle alternating current. The relay is thrown over 25 times per second, that is it finds itself 25 times in azimuth position and 25 times in pick-up position. The target appears twice on the altitude indicator tube. In this case a determination of the altitude is possible with simultaneous panoramic view. The duplication (Verdoppelung) knob makes possible the modification of the distance between the correlated target blimps.

8. The radio receiver picks up the reflected high frequency impulses, and after amplification sends them to the visual indicators. In the left-hand lower corner of the front plate, there are three openings for the tuning of the first three receiver circuits. By its side is the tuning knob for the first heterodyne oscillator. The tuning is effected with the magic eye. The amplification of the receiver is set by means of the amplification knob.[11]

9. The altitude visual indicator incorporates on the front plate, the altitude visual indicator tube, which has a diameter of 12 cm. The tube has a graduation indicating the number of kilometers. By means of the amplification knob the input signal can be amplified or reduced, depending on the strength of the reflected impulses.
The operating switch can be set in the following positions:
Position 1: "Echo"; the altitude visual indicator tube reproduces only the reflecting signal.

Position 2: "Scale and Echo"; besides the reflected signal, scale impulses are gated (eingeblendet).

Position 3: "Testing or Tuning". In this position, electric controls are effected, which means that only scale impulses are being reproduced.

The scale switch has three positions:
Position 1: 50 km
Position 2: 100 km
Position 3: 200 km
The "inquiry switch" is used when the IFF set is activated. The azimuth set indicates the radiation direction of the antenna. The "brilliancy" knob is used for the regulation of the brilliancy of the target impulse.

The "sharp focusing" knob makes it possible to improve the clearness of the image on the altitude visual indicator tube.
The antenna lever activates the rotations or swinging motions of the antenna; it regulates the speed and sets the direction in which the antenna is to swing.[6]

10. The blocking device (Antenna throw-over switch) has the mission to block the receiver during transmitting operations, and the transmitter during receiving operations.
Visible on the front plate are four glass tubes which are lighted during transmitting operations, the all-around view switch in addition to the pick-up switch with the help of which one can raise and lower the antenna diagram.[12]

11. The rectifier for the antenna motor is a thyratron rectifier. The hand-wheel for the regulation of voltage turns the rotor of an alternating current motor switched as a transformer. With this hand wheel the voltage for the entire P-3 type station can be kept constant.
The knob enlettered "Ein" (connect-in) is used for the engaging of the entire station. The knot marked "Heating" is used for the switching in of the filament voltages.
The knob labelled "Anode" is used for the switching in of the anode voltages.
The knob labelled "Aus" (cut-off) is used for the cutting off the entire station. The red control lamp indicates when the anode knob may be pushed after the pre-heating of the tubes.

12. Cupboard 2 incorporates the amplifier for the rotating recording system (Drehmeldeverstaerker), the panoramic view set, and the current supply for the visual indicators.[13]

13. The amplifier for the rotating recording system has the mission to amplify the displacement current of the signal generator (Drehmeldegeber) in the reducing gear and to transmit it to the receivers of the rotating recording system (Drehmeldeempfaenger). The amplifier consists of a coarse and a fine channel. Under the flap of the front plate there are fuses and tuning elements for the amplifier and a glow lamp which lights up only when the coarse channel is in operation.

14. The panoramic view tube has a diameter of about 5 cm. The tube mounts a ruler with the means of which the direction and distance of a target may be determined. On the left hand side of the front plate of the panoramic view set there are jacks for the testing of voltages, incorporated under a flap. Below the panoramic view tube there is a second flap behind which are installed the same tuning elements as for the altitude indicator.

15. It is the mission of the power supply units to provide stabilized anode voltages for the visual indicators. The left-hand upper corner of the front plate incorporates two red control lamps designed for the control of the anode voltages produced. Beside them there are two control lamps needed for the control of the filament voltages produced. In the middle of the front there are several fuses.[13]

16. The cupboard for the auxiliary components houses interference elimination devices and units of the keying apparatus.[14] The three upper inserts of the cupboard (LSe-3, Sha-3, and T-3) serve the purpose of interference elimination.
Positive direct current impulses of about 12 microseconds duration are produced, these are conducted to the grid of the main thyratron in the keying apparatus.

17. The insert for the impulse release channel (Auslosesimpulskanal) (fourth insert from above) incorporates the mains unit, the multivibrator, the limiter, the impulse amplifier, and the blocking oscillator.
On the left-hand side of the front plate of this insert, there is a switch for the throwing-over of the impulse frequency from 50 to 100 cycles, the knob labelled "Leistung" (output), which, however, belongs to the electric system of the sh insert together with the milliamperemeter. The switch on the right-hand side of the front plate makes possible the setting of a limited sector on the panoramic view set as for example from 50 to 100 km or from 100 to 150 km.

18. The lower insert (WW - 1) contains two thyratrons and a combination of resistors and condensors acting as a phase shifter. This phase shifter makes it possible to modify the power (Leistung) of the high-tension impulses. This modification is effected with the knob labelled "output" (See paragraph 18 above). By turning this knob the resistors incorporated are changed. The high-tension impulses produced are fed to the anode of the auxiliary thyratron.

19. The truck mounting the [illegible] generator is a [illegible] vehicle. This truck houses two gasoline generators serving the power supply of the P-8 station. These generators are identical as the generators used for the RAF radio stations.

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20. The heavy components of the antenna are stored under a tarpaulin behind the driver's seat of the apparatus truck in a space about 1 m wide. The lighter units of the antenna are put under the floor of the vehicle. The sensitive antenna elements such as directors, reflectors and dipoles are stored in the interior of the operator's truck. The pedestal of the mast of the radar antenna is put on the roof of the driver's cabin of the apparatus truck. The pedestal for the mast of the IFF antenna is stored on the generator truck.

21. A portable VHF-transmitter, so-called auxiliary transmitter B, is part of the equipment of the P-8 radar station. This portable transmitter is used for tuning operations on the station and for the representation of the direction finding diagram (Richtdiagramm) on the panoramic view indicator. Auxiliary transmitter B is erected on a pole two meters high, about 100 meters from the P-8 station. The auxiliary transmitter can emit modulated and unmodulated high frequencies. 15

Technical data of Type- P-8 Radar Station

22 Sending frequency: 72.8 to 73.4 megacycles
Impulse frequency: 50 cycles, respectively 100 cycles when operating with interference elimination set.
Output frequency: 1 megacycle (at the receiver)
Impulse duration: 8 microseconds
Sending power: 30 to 50 W
Impulse transmission power: 100 to 120 KW
Transmitting tubes: Type 2 x GI - 1 (-1)
(VHF-triodes)
Assembly time in summer: about 4 hours
Assembly time in winter: about 6 hours
Smallest pick-up angle: 3 to 4°
Smallest distance which can be picked up: 8 to 10 km
Theoretical range: 400 km
Practical range: 250 km to 300 km

Technical Data on the IFF Set.

23. Frequency: about 140 megacycles

Impulse frequency: 50 cycles when coupled with P-8 radar station
50 - 450 cycles, when operating independently.

range: 200 to 300 km

Service Crew for P-8 station.

24. For training purposes, the following personnel is assigned to the P-8 station:
1 chief, a Senior Lieutenant
1 chief operator, a sergeant or master sergeant
1 operator, an NCO
1 "Planshettist" (plotter) an NCO at most
1 telephone operator, a private
2 drivers, privates or PFCs
4 assistants for the handling of the generator simultaneously maintenance personnel.
The P-10 station, an improved version of the P-8 station, is said to be operated by a similar complement.

25. The P-3 radar station had been designed to pick up individual or group targets at a distance of 250 km and to determine the course and altitude of these targets. The station is mainly used within the framework of an early warning system and for the control of fighter aircraft.

The Switching-in Component Units of the Station.

26. **The switch marked "Mains - Generator" on** the input switchboard is set on **"Mains" position when electric power is received** from the electric mains, **and on"Generator" position when the power is** supplied by a generator. **The switch marked "In" and "Out" on the input** switchboard is set on "In" position. By means of the switch connecting the phase tester the voltage of the three phases is checked (220 volt).
The buttons marked "In" and "Filament" are pushed at cupboard 1.
By operating the switch marked "Antenna" which is mounted at the altitude indicator set the antenna is set in motion. When the red control lamp lights up, the button marked "Anode" is pushed. The button marked "Output", which is mounted at the impulse release channel is turned to the right until the milliampere meter indicates 80 to 100 mA.
The button marked"Amplification" and located at the receiver and altitude indicator must be turned to the right until the noise level becomes visible on the altitude indicator tube. The same procedure is applied regarding the all-around indicator.

27. When a target appears on the all-around indicator, its azimuth bearing and distance is determined by means of the incorporated ruler. During these operations the switches marked "all-around pick up" and"all-around coordinate-vertical angle" of cupboard 1 are set on all-around position.

If it is desired to determine the altitude of the target, the switch marked "all-around pick up"is set on pick up position, while the switch marked "coordinate-all-around view-vertical angle" is set on the vertical angle position. The altitude is then determined by means of target blips. When the switch is set on the "coordinate position" the altitude is determined by means of double target blips. Double target blips are used when only few targets are involved.
Altitudes are determined by turning the hand wheel at the goniometer until the target blip in the noise level has disappeared. If this blip does not disappear the wheel is only turned until a minimum of its image is reached. **These two ways of determiningthe** altitude of targets are called minimum directing finding.
When the hand wheel of the goniometer is being turned, the hand over the graduation moves too. The incorporated ruler is turned to the position of the hand and then the altitude of the target can be read in hectometers.
If it is intended to pick up additional target, the two switches mentioned above are again set on the all-around view position. By doing this the receiving diagram is lower and the range for low-flying targets is increased.

Switching-in of the IFF Set

28. The button marked "Abfrage" (Inquiry) is operated.
The set is switched-in for power supply. By means of the button operating the antenna from the control desk the IFF antenna is oriented toward the target. If a friendly aircraft is involved the answering impulses appear on the altitude indicator. The duration of a combination of blips is about 4 seconds.

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